

## 2012-2013 WRHS Science Program

### Science Prerequisites

Grade 9 Courses	Level	Prerequisites		
		Course/Grade	Score on Math MCAS	Teacher Recommendation
Freshman Physics	Honors	Scheduled in Geometry	250 or higher	Required
	CPA	Scheduled in 9 <sup>th</sup> -grade CPA Algebra	220 or higher	Recommended
	CP	Scheduled in 9 <sup>th</sup> grade CP Algebra	220 or lower	Recommended
Topics in Science and Technology	CP	Scheduled in Math Connections I		Required
Grade 10 Courses	Level	Prerequisites		
		Course/Grade		Teacher Recommendation
Biology	Honors	H Fresh Physics B- or better <b>OR</b> AF Fresh Physics A – or better		Required
	CPA	AF Fresh Physics C- or better		Recommended
	CP	None		Recommended
Topics in Biology	CP	Topics in Science		Required
Grade 11 Courses	Level	Prerequisites		
		Course/Grade		Teacher Recommendation
Chemistry	Honors	B+ or better in all math courses B in H Biology <b>OR</b> A in AF Biology B+ or better in AF Fresh Physics		Required
	CPA	AF Algebra B- or better & AF Bio C (B recommended)		Recommended
	CP	None		Recommended
Topics in Physics	CP	Topics in Biology		Required
Grade 11 & 12 Science Electives	Level	Prerequisites		
		Course/Grade		Teacher Recommendation
Modern Physics	Honors	B or better in all Hon math or B+ or better in all AF math H Fresh Physics B or AF Fresh Physics A- Analysis or Pre-Calculus		Recommended
Senior Physics	CPA	C or better in all AF or H science C or better in Adv Algebra or Pre-Calc		Recommended
Engineering Physics Project	CP	Successful completion of Fresh Physics and Algebra, Geo, and Adv Algebra <b>OR</b> Math Connections I, II, & III		Recommended
Anatomy & Physiology	H	B- or better in Biology & Chemistry		Recommended
	CPA	Successful completion of Biology and Chemistry		Recommended
Environmental Science	CPA	Biology		Recommended
Environmental Issues	CP	Successful completion of two lab sciences		Recommended
Natural History of New England	CPA/CP	Successful completion of two lab sciences		Recommended
AP Biology	AP	Successful completion of Fresh Phy, Bio, Chem		Recommended
AP Chemistry	AP	Successful completion of Fresh Phy, Bio, Chem		Recommended
AP Environmental	AP	Successful completion of Fresh Phy, Bio, Chem		Recommended
AP Physics B	AP	Successful completion of Fresh Phy, Bio, Chem		Recommended

**Department Philosophy** - The Science Department of Wachusett Regional High School strives for excellence in the science education of all its graduates. We recognize that science is a human endeavor designed to achieve an increasingly comprehensive and reliable understanding of the human species and its environment. Scientific literacy is an important key to a functioning, technology-based society.

The learning objectives of the Science Department are:

- To provide a basic understanding of how nature works in both living (life science) and non-living (physical science) systems, and to show their interrelatedness.
- To teach students the procedures and techniques used in scientific methodology (e.g. forming a hypothesis, conducting experiments, collecting and analyzing data to draw logical conclusions, etc.).
- To challenge and stimulate students to use, refine and communicate their powers of creative thinking, problem recognition, and problem solving in the scientific application of both hypothetical and real world situations.
- To provide a strong foundation to help our graduates achieve confidence and success in their introductory college science classes.

The WRHS Science Curriculum is designed to provide all students the opportunity to meet the stated objectives in a logical, sequential, comprehensive and varied manner.

The WRHS graduation requirement in Science coursework is the successful completion of three years (15 credits) of course work. College-bound students are strongly urged to take at least three years of laboratory science courses. All of the courses listed within this section are considered laboratory science courses. Non-laboratory science courses are listed in the Family and Consumer section of this guide. All full-year courses receive five credits and all semester science courses receive 2½ credits. AP Biology and AP Chemistry meet 10½ times during the seven-day cycle and receive 7½ credits.

To complete these requirements the traditional course of study would have students taking Freshman Physics; then Biology in their sophomore year followed by Chemistry in their junior year. All three of these courses are offered at various levels H, CPA, and CP. As seniors, students are offered a wide variety of either full-year or half-year electives which are also offered at the various levels of study.

Changes in level will not be made after November 15.

Laboratory sciences require many precautions in order to ensure the safety of the students in a laboratory setting. **Any inappropriate behavior by a student in a laboratory class will result in serious and immediate disciplinary action.**

## Lower School Program

**Freshman Physics** is a physical science course specifically designed for 9<sup>th</sup> grade students beginning their High School science curriculum. This course provides an in-depth investigation of matter and energy. Laboratory investigations, demonstrations, and discussions include the basic physical concepts in motion and forces, conservation of energy and momentum, thermodynamics (heat and heat transfer), waves, and electromagnetism. This program includes substantial hands-on laboratory experiences, which allow students to make observations, raise questions, and formulate hypotheses; design and conduct scientific investigations; analyze and interpret results of those investigations; and communicate and apply their findings. This course boosts students' mathematical skills as they construct and use tables and graphs to interpret data sets, solve simple algebraic equations, perform basic statistical procedures to analyze data, convert units, use scientific notation, determine the correct number of significant figures, and determine percent error from experimental and accepted values.

### **Freshman Physics (H, Grade 9)**

5 credits

The **H level** requires that students have a solid mathematical and science background.

**An Individual Experimental Research Project is REQUIRED for this course, due the Monday before April vacation. No late projects will be accepted.**

### **Freshman Physics (CPA, Grade 9)**

5 credits

The **CPA level** requires a good mathematics and science background.

### **Freshman Physics (CP, Grade 9)**

5 credits

The **CP level** course is taught from a more conceptual view with the amount and level of mathematics required minimized.

### **Topics in Science and Technology (CP, Grade 9)**

5 credits

Topics in Science and Technology is the first year of a three-year sequential course of study. This course studies Engineering Design, Construction Technologies, Energy and Power Technologies of Fluid Systems, Thermal Systems, and Electrical Systems as well as Communication Technologies and Manufacturing Technologies. **All students enrolled in this class will take the STE MCAS in June of their freshman year.**

**Note to students who plan to play sports in college:** The NCAA may not accept this class as a core course requirement.

### **The level of Freshman Science should align with your math choice.**

- Honors Freshman Physics students will also take Honors Geometry
- CPA Freshman Physics students will take CPA Geometry or CPA Algebra I
- CP Freshman Physics students will take CP Algebra
- Topics in Science and Technology will take Math Connections I

**All Freshman Physics students will take the Introductory Physics MCAS in June of their freshman year.**

### **Biology (H, Grade 10)**

5 credits

Honors Biology requires students to have exceptional reading comprehension skills and a strong mathematics background. This course is a study of biology as an inquiry into life with emphasis on the laboratory approach. The investigative processes of science are used to develop an in-depth understanding of the principles of biology from the standpoints of unity of pattern, diversity of

organisms, and the continuity of life. **An Individual Experimental Research Project is REQUIRED for this course, due the Monday before April vacation. No late projects will be accepted.**

### **Biology (CPA, Grades 10 – 12)**

5 credits

CPA Biology requires students to have strong reading comprehension and problem-solving skills. This laboratory-based class includes a study of the methods of science as a process of inquiry, including the concepts of cellular structure and function, molecular genetics, heredity, taxonomy, and evolution.

### **Biology (CP Grades 10 – 12)**

5 credits

This laboratory-based course includes a study of the methods of science as a process of inquiry by including the concepts of cellular structure and function, molecular genetics, heredity, taxonomy, and evolution. More curricular reinforcement is given as students work to understand the difficult vocabulary and concepts of biology.

### **Topics in Biology (CP, Grade 10)**

5 credits

The curriculum in this class is designed specifically to prepare students for the Biology MCAS test.

**Note to students who plan to play sports in college:** The NCAA may not accept this class as a core course requirement.

## **Lower School/Upper School Options**

### **Practical Science for Everyday Living (Grades 9-12)**

5 credits

This course is a comprehensive program that will cover areas of Physical and Earth Science that directly impact everyday living. Students will study about the nature of basic things such as motion, force, energy, matter, heat, light and sound. Through functional exercises students will become knowledgeable of the earth and how it relates to their lives.

### **Life Science (Grades 9-12)**

5 credits

This course is a comprehensive program that covers areas of Life Science. Covering a broad spectrum of topics, this course provides a fascinating introduction to the many life forms that inhabit our world. Students will learn about the many variables that affect life: the diseases that afflict different organism, the effect of ecology on plants and animals, and how various life forms adapt to changes. A variety of materials will be used, including class activities and experiments.

### **Earth and Environmental Science (Grades 9-12)**

5 credits

This science course is designed to give students a basic knowledge of the planet Earth: its features, its forces, and its place in the universe. Included will be units on weather, climate, rock formation, the environment and ecology, mineral and water resources. A variety of methods will be used, including class activities and experiments.

### **Health, Nutrition and Foods (Grades 9-12)**

5 credits

This course is designed to develop and promote functional health and nutrition and to study its effects upon human body systems. Topics will include body systems, foods and nutrition for healthful daily living, safety and sanitation as well as using simple recipes to prepare foods.

## Upper School Program

### **Chemistry (H, Grades 11-12)**

5 credits

This course is an in-depth, fast-paced study of chemistry as an experimental science for the highly motivated student or science major. Major concepts such as atomic structure, bonding, reactions, gases, acids/bases, and kinetics will be discussed in great detail in a lecture setting and then reinforced with laboratory work. A requirement of the class is the memorization of ions and formulas necessary for the study of chemistry. **An Individual Experimental Research Project is REQUIRED for this course, due the Monday before April vacation. No late projects will be accepted.**

### **Chemistry (CPA, Grades 11-12)**

5 credits

This course is an in-depth study of chemistry as an experimental science for the college bound student. Major concepts such as atomic structure, bonding, reactions, gases, and acids/bases are covered. A requirement of the class is the memorization of ions and formulas necessary for the study of chemistry. Course work as well as laboratory work will be performed to reinforce key concepts to better the students' understanding. Over the course of the year, skills and techniques in handling materials, apparatus, and concepts will be developed.

### **Chemistry (CP, Grades 11-12)**

5 credits

CP Chemistry follows the same curriculum as CPA Chemistry. It is an in-depth study of chemistry as an experimental science for the college bound student. Major concepts such as atomic structure, bonding, reactions, gases, and acids/bases are covered. Course work as well as laboratory work will be performed to reinforce key concepts to better the students' understanding. Over the course of the year, skills and techniques in handling materials, apparatus, and concepts will be developed. Classes are smaller and include more differentiation and mathematical support.

### **Topics in Physics (CP, Grade 11)**

5 credits

This course will not only complete a three-year sequence in science required for graduation, it is also designed to teach the Massachusetts State Frameworks in Physics. Students will prepare to take the Introductory Physics MCAS in June. Multiple instructional strategies will be explored to help students understand the concepts of Physics. Mathematical applications of physics will be minimized.

**Note to students who plan to play sports in college:** The NCAA may not accept this class as a core course requirement.

## Science Electives

### **Modern Physics (H, Grades 11 & 12)**

5 credits

Lasers, quantum mechanics and the nature of light and gravity, black holes, exotic sub-nuclear particles, high-temperature superconductivity and the "history of the future of the universe" are some of the topics that will be investigated in this physics course that highlights the physics of the past 100 years. This course, open to juniors and seniors, serves as a natural follow-up to the physics course taken during freshman year. It is intended to be a more rigorous treatment of topics in mechanics, properties of matter, an introduction to thermodynamics, wave theory, electromagnetic interactions, and modern physics (relativity, atomic, nuclear, sub-nuclear, quantum etc.) with an emphasis on mathematical techniques in problem solving and data analysis. Labs will be done on a regular basis when possible. Computers will also be used in the data collection and analysis process. This course will provide a strong foundation for those students planning to major in physics or engineering in college.

### **Senior Physics (CPA, Grades 11 & 12)**

5 credits

This course builds on the science and mathematical skills obtained during the first three years of high school and will serve as a preparation for an introductory college Physics course. The goal for the course is to provide a deeper understanding of the physics concepts learned in Freshman Physics. The additional topics covered include rotational mechanics, wave theory, electricity and magnetism, optics and thermodynamics. This class should be considered by students planning to major in any math, science or engineering program. Group and individual projects are a major component of this course.

### **Engineering Physics Projects (CP, Grades 11 & 12)**

5 credits

Students will learn and apply the basic principles of physics, with an emphasis on mechanics and material science, and apply the basic principles of engineering design in an integrated problem-solving environment. These devices might be potential solutions to a specific problem utilizing physics knowledge gained in the course. Many of the topics include the design, fabrication and testing of a device that demonstrates the principles being presented. Guest speakers from the engineering field contribute to the curriculum as they discuss various opportunities in engineering and provide real life examples of using engineering to solve problems.

**Note to students who plan to play sports in college:** The NCAA may not accept this class as a core course requirement.

### **Anatomy and Physiology (H/CPA, Grade 12)**

5 credits

This course is designed to give students an understanding of the basic structure and functions of the human systems. Students preparing for health-related careers and those interested in studying the principles of biology using the human species as an example will find this course valuable. Demonstrations and experiments are used to illustrate the principles and concepts of the course including the problems of disease, nutrition, heredity, pollution, and overpopulation. Independent literature and electronic research is required each term. Students will dissect a fetal pig. **There is a \$25 lab fee for this elective.**

### **Environmental Science (CPA, Grades 11 & 12)**

5 credits

This course aims to develop an understanding of the environment – rocks, soil formation, glaciations, and climate. Environmental problems and the laws that govern these issues will be explored. These problems are studied in a variety of ways in the classroom, in the laboratory, in the field, and through project work. The course is designed to enable students to experience the environmental impacts of local development and to understand the effects of growth and development on the environment.

### **Environmental Issues (CP, Grades 11 & 12)**

2½ credits (Offered first semester)

This course aims to develop an understanding of environmental problems and the laws that govern these issues and to understand the effects of growth and development on their environment and on the quality of life, our land, air, and water resources. These problems are studied in a variety of ways in the classroom, in the laboratory, in the field, and through project work.

### **Natural History of New England (CPA/CP, Grades 11 & 12)**

2½ credits (Offered second semester)

This course meets as a combined CPA/CP class and is a general survey course designed to acquaint the student with the natural history of New England. This includes studies of soil and rock formation, plants, animals and the ecology of the area.

## Advanced Placement Courses

### **Advanced Placement Biology (AP, Grades 11\* & 12)**

7½ Credits (Offered 2010-2011)

Advanced Placement Biology is designed to be the equivalent of a college introductory biology course usually taken by students majoring in the sciences during their first year of college. Students who are successful in this course may have the opportunity, as college freshmen, to undertake upper-level courses in biology or to register for courses for which biology is a prerequisite; students may also fulfill a basic requirement for a college laboratory science course. AP Biology is designed to be taken by students after the successful completion of a first course in high school biology and high school chemistry. **There is a \$25 lab fee for this elective.**

### **Advanced Placement Chemistry (AP, Grade 12)**

7½ Credits

This course is designed to be the equivalent of a 1st year college general chemistry course and follows the College Board's AP Chemistry syllabus. This course presents a rigorous treatment of the following concepts: the nature of matter, gas laws, thermodynamics, stoichiometry, bonding, chemical kinetics, and chemical equilibrium. Laboratory activities involve a variety of techniques and methods, including precision instrumental work, as well as qualitative analysis of unknowns. Students will be required to do extensive writing, and to keep a thorough and accurate laboratory notebook. **There is a \$25 lab fee for this elective.**

### **Advanced Placement Environmental Science (AP, Grade 12)**

5 Credits

The AP Environmental Science course is designed to be the equivalent of a one-semester, introductory college course in environmental science. The goal of the course is to provide students with the scientific principles, concepts and methodologies required to understand the interrelationships of the natural world. Students will be able to identify and analyze environmental problems both natural and human-made, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving and/or preventing them. AP Environmental Science promotes the development of citizens who could make informed, knowledgeable decisions concerning environmental issues. AP Environmental Science is designed to be taken by students after the successful completion of a first course in high school biology and high school chemistry. **There is a \$25 lab fee for this elective.**

### **Advanced Placement Physics B (AP, Grade 12)**

5 Credits

Physics B includes Newtonian mechanics, fluid mechanics, thermal physics, electricity and magnetism, waves and optics, and atomic and nuclear physics. Knowledge of algebra and trigonometry is required for this course and ideas of calculus may be introduced in connection with physical concepts such as acceleration and work. Understanding of the basic principles involved and the ability to apply these principles in the solution of problems are the major goals of the course. Guided inquiry and student-centered learning will be used to foster the development of critical thinking skills. **There is a \$25 lab fee for this elective.**

**Students taking more than one senior elective will pay only one lab fee**